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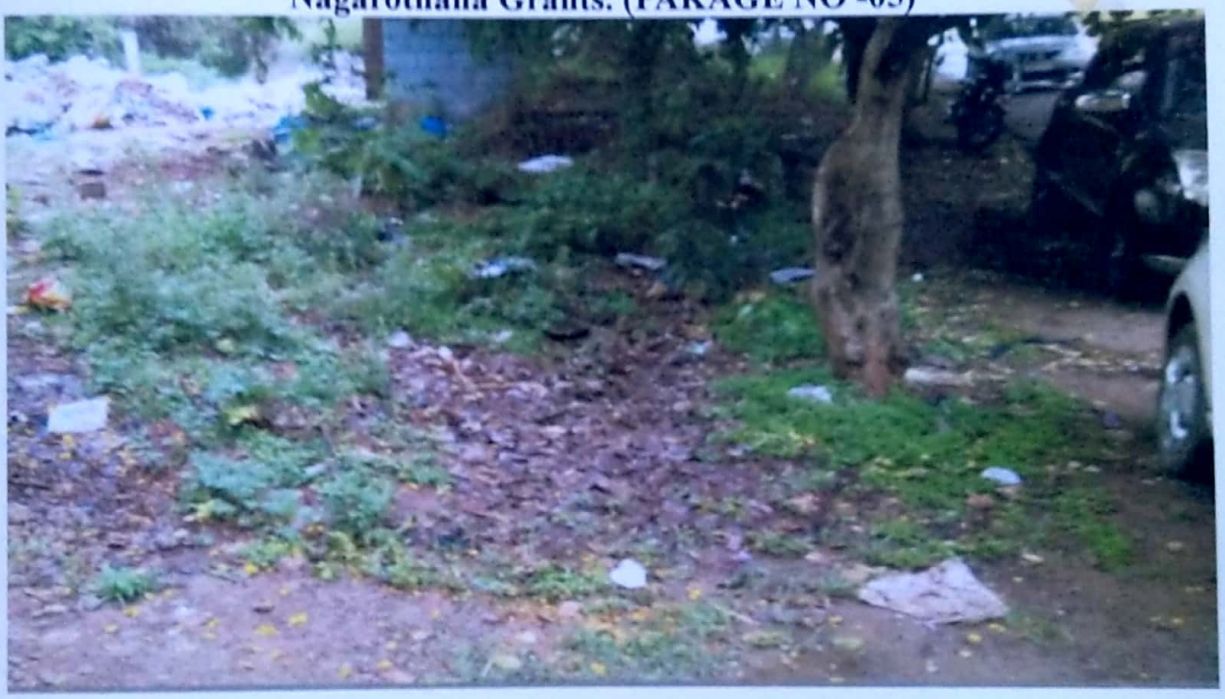
Bruhat Bengaluru Mahanagara Palike

DETAILED PROJECT REPORT

CONSULTING SERVICES FOR PREPARATION OF DETAILED PROJECT REPORT FOR

Project: Improvements to Roads, Drains and Other Developmental Works at Shivamandira Road, Matru Layout, Shaada Nagar Judicial Layout and Surrounding Area in Ward no 02,03,04 of Yelahanka Division under Amruth Nagarothana Grants. (PAKAGE NO -05)



COST OF THE PROJECT: 1295.00 LAKHS

Submitted To:
The Executive Engineer,
Yelahanka Division,
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c/om 123

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Annexure

Annexure A. 1.1 Key Map

Annexure A.7.1 Detailed Cost Estimate, Rate Analysis

Drawings

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Chapter -1

INTRODUCTION

1.1.1 General

Bengaluru is the capital of India's southern Karnataka state. The center of India's high-tech industry, the city is also known for its parks. It is also known as the Garden City because of its many beautiful gardens and parks. By Cubbon Park, Vidhana Soudha is a Neo-Dravidian legislative building. Former royal residences include 19th-century Bangalore Palace, modeled after England's Windsor Castle, and Tipu Sultan's Summer Palace, an 18th-century teak structure.During the last couple of decades, city has witnessed drastic increase in population, change in land use pattern of the city, life style of the people and their commuting habits and the revolutionary changes that has taken place in the automobile industry. This has contributed to the growth of vehicular traffic in an enormous way.

1.1.2 City Background

It also called the Silicon Valley of India , because of the high concentration of IT industry. Bangalore is rated to one of the fastest growing cities in Asia with a current population of more than 10 million. During the last couple of decades, city has witnessed drastic increase in population, change in land use pattern of the city, life style of the people and their commuting habits and the revolutionary changes that has taken place in the automobile industry.

1.1.3 Population

The Bangalore city population is currently more than 12.5 million and increasing in a forward march. The lifestyle of the citizens is changing day to day due to globalization and introducing of new brands in all sector. Bangalore, the fastest growing city of India, comprises of a dynamic blend of people, belonging to various religions, castes and communities. With the introduction of information technology in the city, it has assumed an international character. IT professionals not only from the various parts of India, but also that of the world, are migrating to the city. This has led to Bangalore becoming more like the melting pot of various cultures. Read on to know more about the people and lifestyle of Bengalooru, India.

1.1.4 Traffic growth

What adds to the traffic pressure in Bengaluru in particular is that there is very little scope for expansion of roads and the need to use existing roads for smooth movement of vehicles is even more pronounced. It thus becomes mandatory for the administration to ensure better parking facilities. So far, the government and the BBMP have not taken this issue seriously

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and now the situation is such that it needs to be addressed seriously and effectively. Rapid population growth because of IT and other associated industries in Bengaluru led to an increase in the vehicular population to about 1.5 million, with an annual growth rate of 7-10%. With the increase in population and the expansion of the city, the problem of connectivity of the populace has arisen. Quite obviously personalized modes of transport have grown at a tremendous rate and two wheelers along with the cars almost comprise 90% of the total registered vehicular population in the city. Two wheelers constitute more than 70% of the total volume, while cars comprise 15%, autos 4% and the remaining 8% includes other vehicles such as buses, vans and tempos.

Project Location

The Project includes **Project: Improvements to Roads, Drains and Other Developmental Works at Shivamandira Road, Matru Layout, Shaada Nagar Judicial Layout and Surrounding Area in Ward no 02,03,04 of Yelahanka Division under Amruth Nagarothana Grants. (PAKAGE NO -05)**. The Project area is in **Yelahanka** Assembly constituency, Bangalore. The Project stretch includes **main roads and cross roads and Building of Ward 2, 3 and 4 Yelahanka Division.** By considering the above reasons following roads are taken up for Development with Asphalting depending upon the site scenario.

Key Map of the roads proposed is enclosed in **Annexure A.1.1.**

M/s. SILICON CONSULTING ENGINEERS is entrusted by BBMP to carry out the work of Preparation of Detailed Estimate and Report for the above said work.

Accordingly we **M/s. SILICON CONSULTING ENGINEERS** have commenced the consultancy works as per the scope of services described in the RFP document.

1.2 Scope of Work

The Scope of Services of the Consultancy includes the following:

Inventory and condition surveys for alignment.

- Engineering surveys and investigations
- Improvement to the existing pavement and drains, such as horizontal and vertical alignment, curve straightening, rising of the road level in low lying areas above the HFLs, concentric widening / eccentric widening etc.
- Design of Pavement.
- Design of lateral side drains and Cross drainage works such as culverts etc

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(b) The determination of sub grade CBR (soaked) of the Project.

(c) Benkleman Beam Deflection measurements on the Project Highway.

(d) Preliminary hydraulic data for structures, design discharge, HFL, LWL, etc. with a view to checking adequacy of existing waterway.

(f) A broad assessment of the drainage condition and requirement of the Project Highway.

1.2.1.6 Road signs, safety devices

(a) The Consultant shall propose provision of Road Signs, Pavement Markings, Safety Barriers, Railings, Delineators.

(b) The Consultant shall propose overhead signs on the Project Highway and provide an outline of the same giving size and location.

1.3 Project cost

The Consultant shall work out indicative BOQ of various components and prepare cost estimates of the Project Highway with a break up of cost for each component separately.

1.4 Organisation of Detailed Project Report

The Methodology, as detailed in the Project proposal, it has been followed for carrying out the necessary Investigations and for the Preparation of Detailed Estimate and Report.

This Report includes the following.

- Chapter 2: Investigation & Surveys
- Chapter 3: Reconnaisance survey
- Chapter 4: Design Standard & Specification
- Chapter 5: Design & Proposals
- Chapter 6: Technical Report
- Chapter 7: Project Cost Estimates

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Chapter -2
ENGINEERING SURVEYS AND INVESTIGATIONS

2.1 General

Various surveys and investigations that are the essential inputs for detailed engineering design are detailed in this chapter. All the relevant maps / data / details available with the concerned departments have been collected, compiled and reviewed. Particular attention has been given to past / historical data / reports. A review of the past data available in the various studies has been listed out and such available data has been made use of, after updating / augmenting the data wherever necessary. The data as collected has been made use of in analysis, design, formulation of improvement proposals and costing. The activities have been performed on several fronts fully complying with the requirements. The activities that are carried out are brought out hereunder.

The various engineering surveys / investigations of the road sections include:

- Reconnaissance Survey.
- Visual Topographical Survey.
- Road Inventory Survey.
- Pavement Condition Survey.
- Visual Condition Survey.
- Bridge condition survey
- Soil, geo-technical, material, hydrology and drainage surveys

2.2 Reconnaissance Survey

Reconnaissance Survey of the road, considered for improvements, has been carried out to identify the general condition of roads, drains, culverts and bridges for further surveys / investigations, to understand kind of establishments along the stretches of roads and to work out land acquisition scheme. Making use of the observations / data collected during reconnaissance survey, detailed schedule for surveys / investigations required for the project has been finalized.

2.3 Visual Topographical Survey

Topographic Survey has been conducted all along the corridor by physically measuring the Road Width, Footpath Width, Drain Width, Alignment of Road and with the aid of Google Maps.

2.4 Road Inventory Survey

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Chapter -3
RECONNAISSANCE SURVEY

3.1 General

The Reconnaissance survey is an extensive study of an entire area that might be used for a road or airfield. Its purpose is to eliminate those routes or sites which are impractical or unfeasible and to identify the more promising routes or sites. Existing maps and aerial photographs may be of great help.. The activities that are carried out are brought out hereunder.

The various engineering surveys / investigations of the road sections include:

- Study of topographical survey sheets, agricultural, soil, geological and meteorological maps and aerial photography.
- Aerial photography wherever necessary and feasible, and
- Ground reconnaissance including another round of serial reconnaissance for inaccessible and difficult stretches, where required.

Reconnaissance survey starts with a study of the all available maps. After study of the topographical features on the maps, a number of economical alignments feasible in a general way are selected keeping in view the following points:

(i) The alignment to take into account all the control points and to be shortened and more economical compatible with requirements of gradients and curvature.

(ii) Shape of the alignment.

(iii) Avoidance as far as possible of marshy ground, steep terrains, unstable hill features and areas subject to severe climatic conditions, flooding and inundation.

(iv) Need of connecting important villages and towns.

(v) Bridging problems, and

(vi) Need to preserve environment and maintain ecological balance.

3.2 Ground Reconnaissance Survey:

Ground reconnaissance consists of general examination of ground by walking or riding along the probable routes and collecting all available information necessary for evaluating the same. In the case of hill sections, it may be advantageous sometime to start the reconnaissance from an obligatory

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Chapter -4
DESIGN STANDARD & SPECIFICATION

4.1 General

Planning and design of roads & CD structures, pedestrian facilities and street furniture are essentially based on the IRC standards and MoRT&H specifications. Whenever, the codes / standards are silent on some of the aspects, the same has been planned / designed based on sound engineering practices. Design standards relevant to the project road along with the broad list of design parameters and the relevant IRC codes / specifications have been detailed in **Table 4.1.**

Table 4.1: Design Standards

SL No.	Design Parameters	Reference Code
1.	Geometric Design Standards • Carriageway width • Shoulder • Footpath • Median • Camber • Super Elevation • Horizontal Alignment • Vertical Alignment	As per IRC: 38 - 1988, IRC: 86 - 1983 & IRC: SP : 23 – 1993
2.	Road Furniture • Road Delineators • Road Markings • Road Signs	 As per IRC: 79 – 1981 As per IRC: 35 – 1997 As per IRC: 67 – 2001
3.	Road Capacity	As per IRC: 106 – 1990
4.	Pavement Design	As per IRC: 37 – 2012 & IRC: SP 62 - 2014
5.	Overlay Design	As per IRC: 81 – 1997
6.	Road Drainage	As per IRC: SP: 42 - 1994 & IRC: SP: 50 - 1999
7.	Culverts	As per relevant IRC codes and MoRT&H

The project road section passes through plain terrain. Design standards (as appropriate) have been further elaborated under the following heads:

- Geometric Design
- Pavement Design
- Drainage
- Road Furniture and Appurtenances
- Bridges and CD Structures

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durable, uncoated, dry and free from soft or flaky pieces and organic or other deleterious substances.

Composition of bituminous concrete pavement layers

S.No.	Grade of Mix	Grading 1	Grading 2
	Nominal aggregate size	19 mm	13 mm
	Layer thickness	50- 65 mm	30 – 45 mm
	IS Sieve <mm	Cumulative % by weight of total aggregate passing	
1.	26.5 mm	100	
2.	19 mm	79 -100	100
3.	13.2 mm	59 - 79	79 -100
4.	9.5 mm	52 - 72	70 - 88
5.	4.75 mm	35 - 55	53 - 71
6.	2.36 mm	28 - 44	42 - 58
7.	1.18 mm	20 - 34	34 - 48
8.	0.60 mm	15 - 27	26 - 38
9.	0.3 mm	10 - 20	18 - 28
10.	0.15 mm	5 - 13	12 - 20
11.	0.075 mm	2 - 8	4 - 10
Bitumen content, % by weight of total mixture[1]		Min. 5.0 – 6.00 %	Min. 5.00 – 7.00 %
Bitumen grade		65*	65*

Marshall Properties Requirements for bituminous concrete layers

S.No.	Requirement of property of mix from Marshall sample	Standard
1.	Minimum stability (kN at 60°C)	9.00
2.	Minimum flow (mm)	2
3.	Maximum flow (mm)	4
4.	Compaction level (Number of blows)	75 blows on each of the two faces of the specimen
5.	Per cent air voids	3 -6
6.	Per cent voids in mineral aggregate (VMA)	See table 9.28 below
7.	Per cent voids filled with bitumen (VFB)	65 -75
8.	Loss of stability on immersion in water at 60 C (ASTM-D-1075)	Min. 75 % retained strength

4.8.5 Dry lean concrete sub-base

1) Ordinary Portland or Portland slag or Portland puzzolana cement conforming to 15:269 IS: 455 and IS: 1489 respectively may be used. If the sub-grade contains soluble sulphate in excess of 0.5 per cent cement used shall be sulphate resistant and shall conform to IS: 6909.

2) Coarse and fine aggregates shall conform to IS: 383. If required coarse aggregate should be

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- Distribution of commercial traffic over the carriageway.

5.5.8 Computation of Design Traffic

The design traffic in terms of the cumulative number of standard axles to be carried during the design life of the road should be computed using the following equation:

$$N = \frac{365*\left[(1+r)^n - 1\right]}{r} * A * D * F$$

Where,

N = Cumulative number of repetitions in terms of million standard axles

A = Initial traffic in the year of completion of construction in terms of the number of Commercial Vehicles per Day (CVPD).

D = Lane distribution factor (as explained in Para 4.5.1 (IRC: 37-2012)

F = Vehicle Damage Factor (VDF).

n = Design life in years.

r = Annual growth rate of commercial vehicles in decimal (e.g., for 5 per cent annual growth rate, r = 0.05).

Traffic Growth Rate

The present day traffic has to be projected for the end of design life at growth rates ('r') estimated by studying and analyzing the following data:

(i) The past trends of traffic growth; and

(ii) Demand elasticity of traffic with respect to macro-economic parameters (like GDP or SDP) and expected demand due to specific developments and land use changes likely to take place during design life.

If the data for the annual growth rate of commercial vehicles is not available or if it is less than 5 per cent, a growth rate of 5 per cent should be used.

The traffic in the year of completion is estimated using the following formula:

$$A = P\,(1+r)^n$$

Where,

P = Number of commercial vehicles as per last count.

n = Number of years between the last count and the year of completion of construction

5.5.9 Selection of Subgrade CBR for Pavement Design

The CBR values of the sub grade soil vary along a proposed alignment even on a homogeneous section. The pavement design is done based on Considering the CBR of Borrow area for

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Reconstruction and Widening Section and For Existing portion the CBR of Existing Sub grade / Sub base is considered.

5.5.10 Flexible Pavement Design – Re-construction

The CBR values of the subgrade soil vary along a proposed alignment even on a homogeneous section. The pavement design is done based on Considering the CBR of Borrow area for Reconstruction and Widening Section and For Existing portion the CBR of Existing Subgrade/Sub base is taken,

5.5.11 Widening Proposals & Typical Cross Sections

a) Widening options for the project road were arrived based on,

- Lane requirements based on traffic capacity analysis.
- Requirement of service roads along built-up areas.
- Presence of religious structures.
- Availability of land

Formulation of carriageway widening schemes involves 1) estimation of extent of widening required in terms of additional lanes and 2) lateral arrangement of these additional lanes to the existing carriageway. Guidelines for the requirement of additional lanes is derived from, Traffic Study – Projected Traffic Volume vis-à-vis Capacity of each lane / road. Within the existing ROW as far as possible, and retaining the existing pavement, cross drainage structures and bridges as far as possible, without compromising the recommendations of IRC / MORT&H. Requirement of service roads along built-up areas. Additional lanes shall be added to the existing road either concentrically or eccentrically, depending on

1. The availability of right of way on either side of the existing centre line,
2. Topography and built-up areas
3. Due to specific field constraints (such as any sensitive features like water bodies, important structures etc.), localized shifting has been emerged at many places. However the actual widening will be finalized on the basis of field survey data, study of soil erosion and possibility of landslide and after completing the Environmental Assessment (EA) and Social Impact Assessments (SIA) of widening and Public Consultation.

b. Truck lay-bye and Bus bay pavement

In the case of rural areas, it is recommended to provide interlocked concrete block (M40) pavements for truck lay bye and Bus bays. An interlocked concrete block pavement resembles the structure of flexible pavement with an exception that in place of asphalt layers, cement concrete blocks are used with a levelling course of sand on top of the Base layer.

5.5.12 Design Standards Related to Rigid Pavement Design

Design standards related to pavement design are essentially based on the guidelines given in

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